DRL NO. 81
DRD NO. SE-6

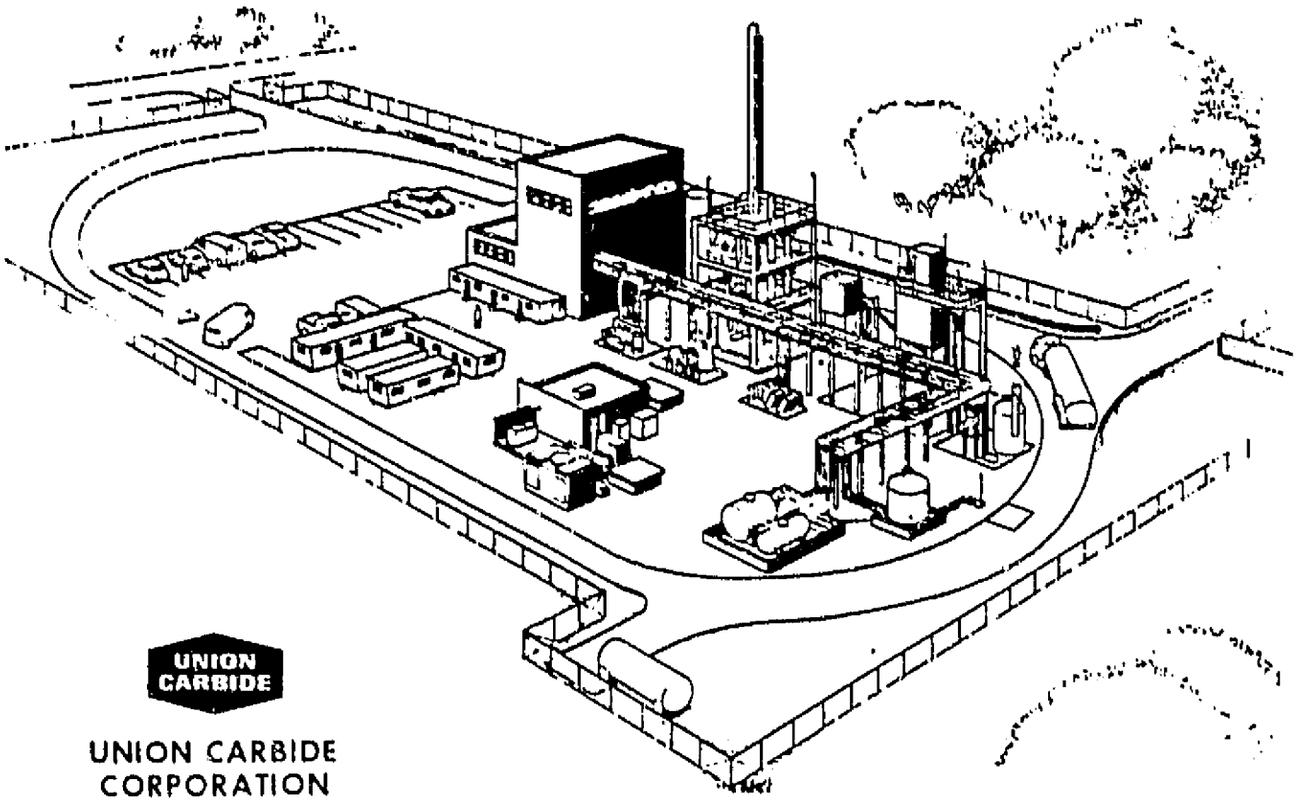
DOE/JPL 954334 – 20
Distribution Category UC - 63

QUARTERLY PROGRESS REPORT

JULY – SEPT. 1981

Flat-plate Solar Array Project

EXPERIMENTAL PROCESS SYSTEM DEVELOPMENT UNIT FOR PRODUCING SEMICONDUCTOR-GRADE SILICON USING THE SILANE-TO-SILICON PROCESS



UNION CARBIDE CORPORATION

CONTENTS

CONTENTS (continued)

CONTENTS (continued)

TABLES

ABSTRACT

This report covers work performed in July, August and September, 1981 on the DOE/JPL Contract 954334, Phase III. This phase consists of the engineering design, fabrication, assembly, operation, economic analysis, and process support R&D for an Experimental Process System Development Unit (EPSDU).

Union Carbide has entered into negotiation with DOE/JPL to cost share in the EPSDU program by continuing with construction and start-up with company funds. This has been necessary due to severe government budget recisions in the solar and other energy related programs. As a consequence of such a plan, UCC will relocate the EPSDU facility to a West Coast location to complete and run the facility.

The design activity is complete and mechanical and electrical bid packages will be reissued to obtain bids at the new EPSDU location. About 95% of purchased equipment has been received and will be reshipped to the West Coast location.

The report generation part of the Data Collection System was completed in this quarter. The draft of the operations manual is about 50% complete and the design of the free-space system is continuing.

In the area of melting/consolidation, Kayex has demonstrated the system using silicon powder transfer, melting and shotting on a psuedo-continuous basis. Experimental activity ceases at the end of the quarter and documentation of the results and recommendations will be completed in the fourth quarter.

A proposal has been submitted to continue the very promising fluid-bed work in the next fiscal year with a relatively small budget. The EPSDU pilot plant will probably be funded by UCC in the next fiscal year pending a favorable agreement to be signed soon between DOE/JPL and Union Carbide.

SECTION I. INTRODUCTION

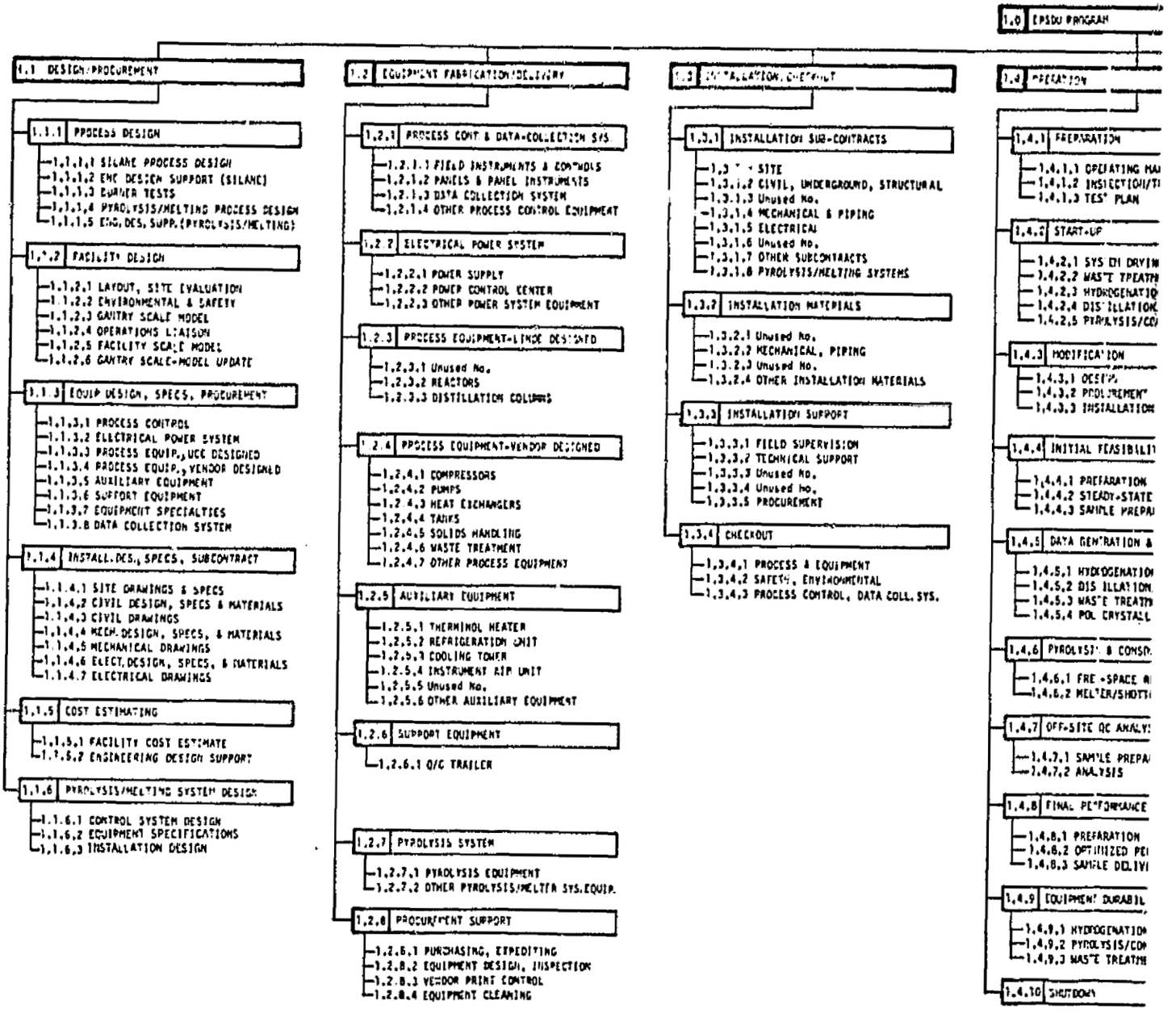
This report covers work performed in July, August and September 1981 on JPL/DOE Contract 954334, Phase III.

The overall objective of the LSA Silicon Material Task is to establish a chemical process for producing silicon at a rate and cost commensurate with the production goals of the LSA project for solar-cell modules. This material must be suitable for utilization in the large-area sheet process and in the automated process for the fabrication of solar cells having satisfactory physical and electrical performance characteristics.

As part of the overall Silicon Material Task, Union Carbide developed the silane-silicon process and advanced the technology to the point where it has a definite potential for providing high-purity polysilicon on a commercial scale at a price of $14/kg by 1986 (1980 dollars). This work, completed under Phases I and II of the contract, provided a firm base for the Phase II Program (initiated in April 1979) aimed at establishing the practicality of the process by pursuing the following specific objectives:

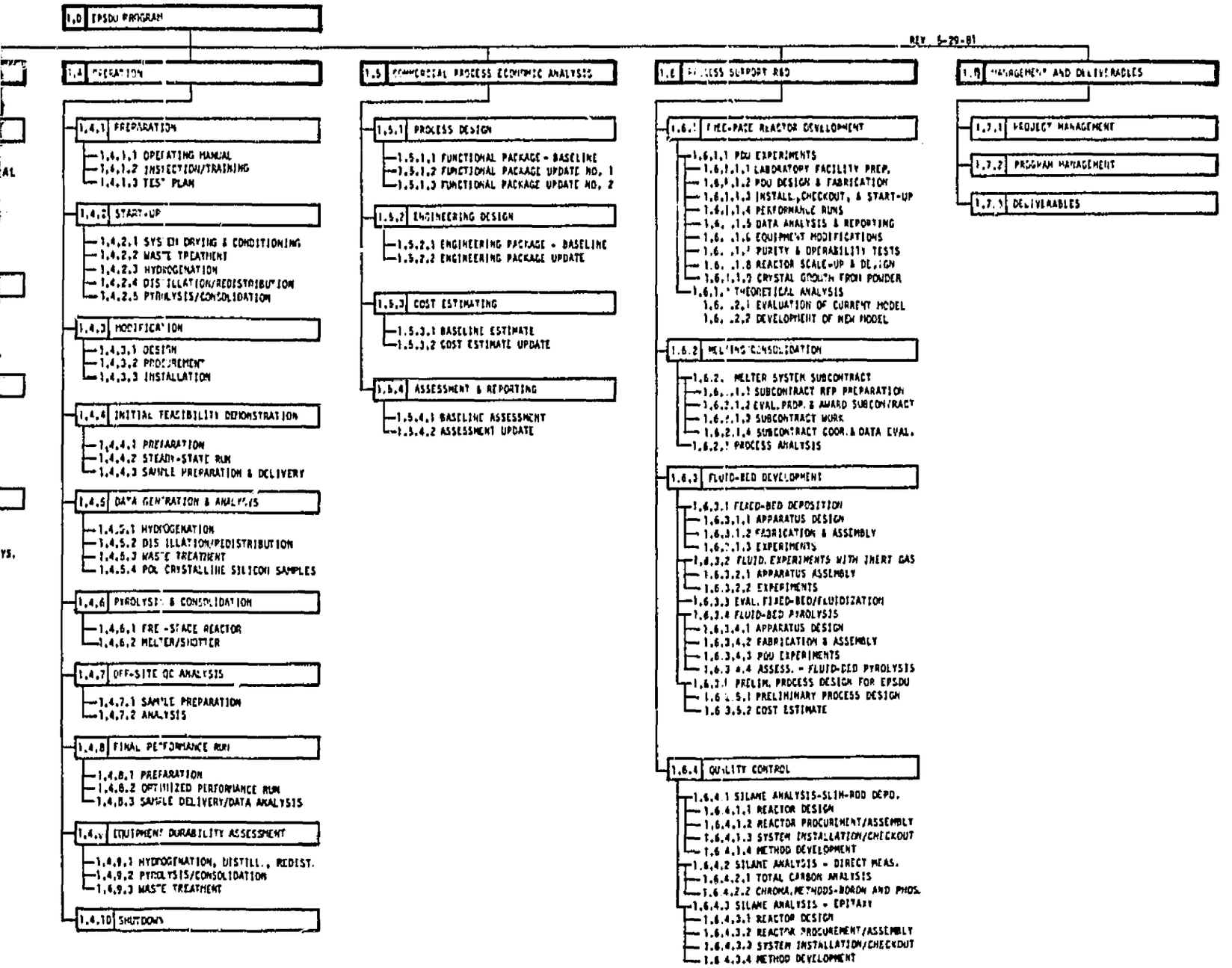
- Design, fabricate, install, and operate an Experimental Process System Development Unit (EPSDU) sized for 100 MT/Yr to obtain extensive performance data to establish the data base for the design of commercial facilities.
- Perform supporting research and development to provide an information base usable for the EPSDU and for technological design and economic analysis for potential scale-up of the process.
- Perform iterative economic analyses of the estimated product cost for the production of semiconductor-grade silicon in a facility capable of producing 1000 MT/Yr.

ORIGINAL PAGE IS
OF POOR QUALITY



FOLDOUT FRAME

TABLE I
WORK BREAKDOWN STRUCTURE
REVISED FOR FY81, 82, & 83



FOLDOUT FRAME 2

This process for preparing semiconductor-grade silicon in the EPSDU from metallurgical-grade (M-G) silicon is based on a well-integrated arrangement of purification steps that provides a cost-effective process system.

The three basic steps entail converting M-G silicon to trichlorosilane, redistributing the trichlorosilane to produce silane, and thermally decomposing the silane to form silicon powder. The powder is then melted and the molten silicon is cast into polycrystalline silicon for subsequent use in fabricating solar cells.

The technical progress presented in this report is arranged according to the work Breakdown Structure (WBS) shown in Table I.

SECTION II. TECHNICAL ACTIVITIES (BY WBS NUMBER)

1. EPSDU PROGRAM

As illustrated in Table I, the current Phase III Program consists of seven primary (WBS level 2) divisions of effort:

- EPSDU Design and Procurement
- EPSDU Equipment Fabrication and Delivery
- EPSDU Installation and Checkout
- EPSDU Operation
- Commercial (1000 MT/Yr) Process Economic Analysis
- Process R&D to Support EPSDU Design and Commercial Analysis
- Program Management

Collectively, these activities encompass all efforts required to attain the program objectives. The subdivisions (WBS levels 3, 4, and 5) define the individual work items that must be performed. The progress for this quarter, documented in this section, is reported at the work-item level.

1.1 EPSDU DESIGN/PROCUREMENT

This effort includes all engineering, design, and procurement activities necessary to transform the process design, developed during the Phase II Program, into a complete installation-drawing package for EPSDU. The major tasks include process design updates, facility design, equipment design and procurement, installation design, and cost estimating support.

1.1.1 Process Design

The process design effort is geared toward using the most recent information available to provide the most practicable integration of process subsystems for attaining the EPSDU Program objectives. The process design package consists of a heat/mass balance, process description, process flow diagram, and functional specifications for process equipment. The original

package, issued in June 1979, served as the basis for the subsequent engineering effort. Beneficial data from the supporting R&D effort and other process-related analyses and experiments were used to update the original package. Process engineers, using information available from the Phase I and Phase II Programs, provide direct support to the facility and equipment design efforts.

1.1.1.2 Engineering Design Support

This activity is complete except for some minor engineering details. An internal meeting will be held in October to assure that all items have been addressed.

1.1.2 Facility Design

The Gantry scale model has been completed and shipped. Work on the facility scale model has been discontinued since the EPSDU layout at the new site will be rearranged.

1.1.3 Equipment Design, Specification, Procurement

The equipment related effort includes development of the control system, preparation of the piping and instrumentation diagram, preparation of wiring schematics and control panel drawings, and the design of equipment. The specification activity includes definition of specific requirements for each item of equipment, preparation of bid packages, evaluation of vendor quotation, and preparation of final specifications and drawings. Procurement includes the issuance of procurement packages to selected vendors and obtaining comprehensive design information necessary for preparing installation drawings.

The design and procurement of each item of equipment is accomplished through the combined efforts of process engineers, equipment engineers, and purchasing agents. These efforts produce a series of documents that evolve, ultimately, into a complete, definitive procurement package. The individual

documents are as follows:

- Functional Specification
- Engineering Specifications
- Request For Quotation (RFQ)
- Request For Requisition (RFR)
- Purchase Order (PO)
- Procurement Status Report

These six documents serve as milestones for measuring performance of the procurement cycle for each item of equipment.

1.1.3.1 Process Control

The final review schematic wiring diagram and the primary recommended spare parts list were issued. The preliminary programming of the Modicon Programmable Controller was completed in September.

1.1.3.7 Other Equipment, Specialties

The cleaning of speciality items (valves, etc) to meet the cleaning specifications is approximately 80% complete and will be completed in October. The Pyrolysis Hydrogen Compressor refitting will also be completed in October.

1.1.3.8 Data Collection System

A description of the Data Collection System for the 100 MT/Yr silane-to-silicon EPSDU was issued. The Archive System was completed, but documentation remains to be written.

1.1.4 Installation Design, Specification, Subcontract

This design effort includes development of separate installation drawing packages for the site, civil, mechanical, and electrical specialties based on the engineering design effort and vendor-supplied information. Specification activity includes definition of specific requirements for performing all installation functions. Subcontracting includes the preparation of bid packages, evaluation of quotes, sub-contractor selection and contract negotiation.

1.1.4.4 Mechanical Design, Specification & Materials and

1.1.4.5 Mechanical Drawings

Final drawings and specification changes were completed and the mechanical installation package was marked "For Construction/Hold." The potential contractors were notified that contracts would not be awarded at East Chicago.

1.1.4.6 Electrical Design, Specification & Materials and

1.1.4.7 Electrical Drawings

The bids for the EPSDU electrical work were received and evaluated. A contract was not awarded since the EPSDU pilot facility will be relocated in Washington state. Final drawing and specification changes were completed and the electrical installation package was marked "For Construction/Hold."

1.1.6 Pyrolysis/Melting System Design

The Free-Space Reactor/Powder Hopper design previously developed was reviewed and design modifications were made to improve the design.

Modifications include:

- Safety valve was replaced with a burst disc.
- Vacuum line was relocated to prevent plugging.
- Powder transfer line was respecified to use polished stainless steel tubing.
- Agitator was relocated and supports redesigned.
- Powder level detectors were added to the silicon powder/ hopper design.
- Seal for quartz liner was modified to a metal bellows type.

Fabrication drawings for the free-space reactor were completed. Design work has begun on the hopper vessel which feeds silicon powder to the melter unit. A preliminary lay-out was completed for the steel structure

which supports the free-space reactor/hopper, silicon powder melter/shotter and shotter fluid bed system. Detailed structural drawings are currently under preparation.

1.1.6.1 Control System Design

Preliminary P&I diagrams have been developed for both the free-space reactor and the shotter/melter. The shotter/melter includes the silicon powder melter, shotter and a fluid bed shot collection unit located below the shotter tower.

1.2 EQUIPMENT FABRICATION/DELIVERY

This report item includes all in-house and outside activities associated with fabrication, delivery, and vendor coordination for all items of equipment.

1.2.1 Process Control and Data Collection System and

1.2.2 Electrical Power System

A summary table of purchased items is as follows:

W.B.S. No.	Description	Purchase Orders	Number Of Items	Cost ($,000)
1.2.1.1	Field Instruments and Controls	62	632	166
1.2.1.2	Panels and Panel Instruments	59	462	163
1.2.1.3	Data Collection System	19	150	165
1.2.1.4	Other Process Control Equipment	11	66	51

1.2.2.1	Power Supply	1	1	20
1.2.2.2	Power Control Center	1	2	54
1.2.2.3	Other Power System Equipment	1	1	35

1.2.3 Process Equipment--Linde Designed

This task includes the effort required for the fabrication, delivery, and acceptance of the free-space reactor with hopper, hydrogenation and redistribution reactors, distillation columns, and other process equipment.

A summary table of purchased items follows:

W.B.S. No.	Description	Purchase Orders	Number Of Items	Cost ($,000)
1.2.3.2	Reactors (Vendors Supp)	2	7	139
1.2.3.3	Distillation Columns	6	4	225

1.2.4 Process Equipment--Vendor Designed

This task includes the effort required for the fabrication, delivery, and acceptance of compressors, pumps, heat exchangers, tanks, solids handling equipment, waste treatment equipment, and other process equipment.

A summary table of purchased items follows:

W.B.S No.	Description	Purchase Orders	Number Of Items	Cost ($,000)
1.2.4.1	Compressors	4	5	163
1.2.4.2	Pumps	8	14	54
1.2.4.3	Heat Exchangers	8	14	73
1.2.4.4	Tanks	8	22	181
1.2.4.5	Solids Handling	7	8	24
1.2.4.6	Waste Treatment	3	7	51
1.2.4.7	Other Process Equipment	3	4	67

1.2.5 Auxiliary Equipment

This task includes the efforts required for the fabrication, delivery, and acceptance of the therminol heater, refrigeration unit, hydrogen and argon storage tank, and other auxiliary equipment.

A summary table of purchased items follows:

W.B.S. No.	Description	Purchase Orders	Number Of Items	Cost ($,000)
1.2.5.1	Therminol heaters	1	1	46
1.2.5.2	Refrigeration Unit	1	1	92
1.2.5.3	Cooling Tower	1	1	10
1.2.5.4	Instrument Air	2	2	30
1.2.5.6	Other Auxiliary	26	1663	33

1.2.6 Support Equipment

These items are associated with the fitting-out of the Quality Control (Q.C.) Trailer. The trailer has been delivered to the site at East Chicago, however, laboratory equipment has not yet been received and will not be installed until it is transferred to the Washington site.

1.2.8 Procurement Support

This task includes the Procurement Department effort necessary to initiate, monitor and control the purchase of equipment. It also includes work associated with cleaning specialty items to strict standards, since the component suppliers cannot meet the specifications.

1.2.8.1 Purchasing, Expediting

Equipment items received at the East Chicago site are being checked and tagged. The updated procurement status report is shown as Appendix A. Approximately 92 percent of the items charged to 1.2 have been received and invoices paid.

1.2.8.4 Tonawanda Equipment Cleaning

Cleaning of specialty items is about 80% complete, this activity will be completed in October. The specialty items consist of valves, instruments, transmitters, flowmeters, etc.--564 items will be cleaned to meet the chlorosilane specification, and an additional 147 items will be cleaned to meet electronic grade quality.

1.4 OPERATION

1.4.1 Preparation

1.4.1.1 Operations, Operating Manual

Volume I of the operating manual has been put on the word processor system. This volume contains two sections--the first section deals with chemical safety and gives detailed description of the handling of all chemicals which are involved in the process. The second section addresses plant safety procedures and describes in a manual form the operation regulations for safe operation of a plant. The draft is receiving an initial review by Safety Personnel at Tonawanda and Sistersville, but must be reviewed again before plant start-up to assure that all possible hazards for a silane plant have been considered. Volume II (description of the process) and Volume III (operation) are currently being written.

1.4.1.3 Operations, Field Inspection and Calibration

The equipment at East Chicago has been prepared for transfer to the new site--the gantry has been disassembled and loaded on two trucks. Large vessels are being put on cradles and smaller items are being repackaged. The transfer will be completed in October. The Q.C. trailer has been delivered to East Chicago site but will be transferred to the West Coast.

1.6 PROCESS SUPPORT R & D

The supporting R & D Program is separate from the mainstream design effort and includes all activities associated with analytical and experimental development of the free-space reactor, melting/consolidation system, fluid-bed reactor system, and quality control techniques and procedures. Information generated in this program will be used for the EPSDU effort and the commercial facility economic analysis.

1.6.2 Melting/Consolidation

The design and development effort necessary to obtain a reliable melter for EPSDU involves UCC and sub-contractor (Kayex) effort.

1.6.2.1 Melter System Subcontract

This effort involves establishing and managing the sub-contract and sub-contractor development, design, and fabrication efforts.

Kayex Corporation is developing the silicon melter system for EPSDU. The silicon consolidation scheme is based on melting the powder in a quartz crucible and dropping silicon shot from the crucible bottom into a cooling tower where the shot is solidified. The goal is to design and build a melting/consolidating system suitable for installation in the EPSDU.

During the third quarter, the sub-contractor has completed the final experimental runs to demonstrate feasability, the final report writing and documentation will take place in October.

During the period from June through August 1981, 10 melt runs were made. The pertinent details of each run are listed:

- Melt Run Number 10 (6/3): Purpose - to produce shot using a 0.55 mm orifice in a capillary tubing nozzle with 3.21 kg of silicon chunks. Results - shotting was maintained for 35 minutes as a throughput of 2.42 kg of silicon (76% of load) was obtained. Orifice erosion was 15.5% per hour. Excellent shot was produced with an optimum downward applied pressure difference of 2.0 psi.

- Melt Run Number 11 (6/19): Purpose - to produce shot using a 0.66 mm orifice after melting 1.38 kg of silicon chunks and feeding and melting silicon powder. Results - the ball valve between the auger and the furnace tank jammed with powder, so only the chunks were melted and shotted. Nearly 100% throughput was achieved in 15 minutes of shotting. Orifice erosion was 16% per hour.

- Melt Run Number 12 (6/26): Purpose - to melt 1.35 kg of silicon chunks, feed and melt powder, and produce shot using a 0.58 mm orifice. Results - chunks were melted, powder was fed until it backed up into the quartz powder feeding tube and shot was produced. Powder melted in the quartz tube and blocked further powder flow. The shot stream was non-vertical so that "splat" built up on the drop tube wall, eventually falling and breaking the collection tube.

- Melt Run Number 13 (7/9): Purpose - to melt silicon chunks, feed and melt powder and produce shot from a 0.58 mm orifice. Results - the chunks were melted, and powder was fed, but a loss of building water pressure caused the generator to shut down, ending the run prematurely.

- Melt Run Number 14 (7/20): Purpose - to use the cylindrical tubing coil to melt and shot silicon chunks and to feed, melt and shot silicon powder. Results - the coil water stayed cool (<125^{o}F), but power did not exceed 89%, and the chunks could not be melted.

- Melt Run Number 15 (7/22): Purpose - to use the cylindrical tubing coil to melt silicon chunks after raising the generator current limit and balancing the three phases. Results - power reached 104%, but the silicon could not be melted.

- Melt Run Number 16 (7/27): Purpose - to melt and shot silicon chunks and to feed, melt and shot silicon powder using the rectangular tubing coil with a water booster pump in the coil water line which increased coil water flow significantly. A 0.56 mm orifice and 1.15 kg of chunks were used. Results - the coil water stayed cool (<130^{o}F), the chunks were melted, powder was fed and melted and shotting began, but the collection system

piping became blocked with shot and the crucible rose out of the susceptor, ending the run.

- Melt Run Number 17 (8/11): Purpose - to melt silicon chunks, feed and melt silicon powder and produce shot while using a modified collection system, a load cell readout, automatic temperature control, and a shotting rate sensor. Results - the auto temperature control loop and the shot flowrater worked fine, the load cell readout was obscured by changes in pressure difference, and the collection system jammed with shot, forcing termination of the run.

- Melt Run Number 18 (8/18): Purpose - to melt silicon chunks and feed and melt silicon powder and produce shot while using headsets to communicate, using the load cell with the ΔP subtracted out, using a modified collection system with the shot going directly into the collection drum (no diverter plate) and using the automatic temperature controller and shot flowrater. Results - the headsets greatly aided operator communication, the temperature controller maintained a constant temperature at a given set point and was used throughout the run, the collection system worked without any problems, shotting was maintained for a record 1-3/4 hours and shot was definitely produced from melted powder for the first time. Also - arcing occurred on the molybdenum radiation shield, burning holes in it (cause unclear).

- Melt Run Number 19 (8/28): Purpose - to melt and shot silicon chunks, then to feed and melt silicon powder and produce shot in order to test if powder-melt shot is inferior to chunk-melt shot. Also - to use a reverse flow check valve to prevent a negative ΔP which would cause the crucible to jump out of the susceptor, to use a chart recorder for the temperature readout, to use a full-bore ball valve and plexiglass tube for the powder feeding system, to use a quartz crucible hood with a small (1") viewport hole in it, to use a powder level detector in the upper control mounting chamber, and to use a radiation shield wired to its support tube. Results - the temperature readout on the chart recorder occurred over a narrow bank which requires to be widened, the manual powder feed system worked without difficulty, arcing of the radiation shield did not occur and the powder

level detector worked, but it was too sensitive to falling powder. Also high quality shot was obtained from the chunks melt, a powder melt was created with almost no melt in the crucible to start with, and the powder melt shotted without delay (previous powder melt runs had orifice plugging problems), but the quality of the shot was poorer (slower, forming splat) than that of the chunk melt.

Kayex progress reports to UCC are out of phase by one month with the UCC reporting to JPL. During September, Kayex made three successful melt runs and produced a total of approximately 10 kilograms of silicon shot during simultaneous powder feeding, melting and shotting.

1.6.3 Fluid-Bed Development

This development program includes all analytical, experimental, and design effort associated with developing a fluid-bed reactor as an alternative or backup system to the free-space reactor.

The experimental work was stopped in May 1981 due to budget recisions, however, since the fluid-bed concept is potentially very attractive, it is proposed that work will be restarted in the next fiscal year.

1.7 MANAGEMENT AND DELIVERABLES

This report item includes all activities associated with managing the program and insuring that all deliverables are made in accordance with the program requirements.

PIM Meeting

The 18th PIM meeting was held on July 15/16, 1981 in Pasadena. Dr. Morihara made a 45-minute presentation showing EPSDU progress. In his presentation, he showed a collection of colored slides taken at East Chicago during construction and microphotographs of particles taken from the fluid-bed after silane pyrolysis.

Deliverables

The monthly technical progress reports along with the monthly financial and management reports were issued as required by the contract. The second quarter 1981 progress report was also issued during this period. A proposed work plan for continuation of the fluid-bed activity during fiscal year 1982 was delivered to JPL in August.

Major Milestones

The major milestones reached this quarter are presented in Table II.

TABLE II MAJOR MILESTONES REACHED

WBS NO.	MILESTONE	DESCRIPTION OF MAJOR MILESTONE
1.1.2.6	A	Gantry scale model update-complete.
1.2.1.1	G	Field instruments and controls-all equipment received.
1.2.1.3	J	Data collection system-purchase orders issued.
	G	Data collection system-all equipment received.
1.2.2.2	G	Power Control Center-all equipment received.
	H	Power Control Center-final invoice paid.
1.2.4.3	H	Heat exchangers-final invoice payment.
1.2.6.1	G	Q.C. trailer-all equipment received.
1.2.8.3	G	Vendor print control-all drawings on file.
1.4.1.3	O	Test plan started
1.7.3	U, V, W	Monthly financial and management reports.
	V, W	Monthly technical progress reports.
	G	Quarterly technical progress reports.

SECTION III. CONCLUSIONS

Significant highlights and conclusions are presented according to the relevant WBS numbers.

1.1 DESIGN/PROCUREMENT

1.1.1 Process Design

- This activity was completed except for some minor details.
- A safety review of the pressure relief system remains to be made.

1.1.3 Equipment Design, Specification, Procurement

- Schematic wiring diagram was completed.
- Equipment cleaning is 80% complete.

1.1.4 Installation Design, Specification, Subcontract

- Mechanical and electrical construction subcontracts were not awarded due to lack of funds.

1.1.6 Pyrolysis/Melting System

- Fabrication drawings for the free-space reactor were completed.
- Detailed structural drawings are in preparation.

1.2 EQUIPMENT FABRICATION/DELIVERY

- Approximately 95% of equipment has been received.

1.3 INSTALLATION AND CHECKOUT

- Equipment is being repackaged for shipment to the new EPSDU site.

1.4 OPERATION

- The draft of Volume I (Chemical and Plant Safety) is under review by UCC Safety Personnel.
- Volumes II (Description) and III (Operation) is being written.

1.6 PROCESS SUPPORT R&D

1.6.2 Melting/Consolidation

- Kayex has completed the experimental program with a total of 22 melt runs and has demonstrated simultaneous powder feeding, melting and shotting. Documentation will occur during the last quarter.

1.6.3 Fluid-Bed Development

- This activity has been placed on hold but may be continued in 1982 fiscal year.

SECTION IV. PROJECTED QUARTERLY ACTIVITIES

1.1 EPSDU DESIGN/PROCUREMENT

1.1.1 Process Design

- The safety review of the pressure relief system design which was scheduled for the third quarter was not held, the review will take place in the fourth quarter.

1.1.3 Equipment Design, Specification, Procurement

- Cleaning of specialty items will be completed.
- Hydrogen compresser will be refitted.

1.1.6 Pyrolysis/Melting System Design

- Complete design activity for free-space reactor with available manpower and issue a draft package.

1.2 EQUIPMENT FABRICATION/DELIVERY

- Balance of equipment will be delivered to EPSDU site and invoices paid.
- Equipment cleaning will be completed.

1.3 INSTALLATION & CHECKOUT

- Complete transfer of equipment.

1.4 OPERATION

- Complete operations manual.

1.5 COMMERCIAL PROCESS ECONOMIC ANALYSIS

- No activity planned.

1.6 PROCESS SUPPORT R&D

1.6.2 Melting/Consolidation

- Edit and issue final report summarizing the experimental contract with Kayex.

1.6.3 Fluid-Bed Development

- Continue fluid-bed experimental work from the point at which it was stopped in May.

1.7 MANAGEMENT AND DELIVERABLES

- Monthly financial and management reports will be issued.
- Monthly technical reports will be issued reporting contractual items.

APPENDIX A

EQUIPMENT PROCUREMENT STATUS

SEPTEMBER 1981

September 30, 1981

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIP-MENT REC'D
455-04-05 Waste Gas Induction Blower	50001	✓	✓	✓	✓	✓	✓	✓
455-02 Agglomeration Blower	50002	✓	✓	✓	✓	✓	✓	✓
	50003							
	50004							
426-02 Quench Contactor Pump	50005	✓	✓	✓	✓	✓	✓	✓
	50006							
	50007							
	50008							
	50009							
425-02, 03 Recycle H_2 Compressor	50010	✓	✓	✓	✓	✓	✓	✓
443-02 Pyrolysis H_2 Compressor	50011	✓	✓	✓	✓	✓	✓	✓
466-02 Hot Oil Pump	50012	✓	✓	✓	✓	✓	✓	✓
466-04, 05 Cooling Water Pump	50013	✓	✓	✓	✓	✓	✓	✓
424-02 Quench Condenser	50014	✓	✓	✓	✓	✓	✓	✓
424-04 434-06, 10 Reboilers	50015	✓	✓	✓	✓	✓	✓	✓

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIP-MENT REC'D
434-02 Stripper Condenser	50016	✓	✓	✓	✓	✓	✓	✓
421-12, 16 441-06 Tanks	50017	✓	✓	✓	✓	✓	✓	✓
464-02, 04 Ventilation Heat Exchaners	50018							
434-08, 14, 18 Column Condensers	50019	✓	✓	✓	✓	✓	✓	✓
	50020							
	50021							
434-12, 16, 24 . 444-02 Coolers	50022	✓	✓	✓	✓	✓	✓	✓
	50023							
	50024							
	50025							
	50026							
	50027							
434-26 Refrig. Heating Coil	50028	✓	✓	✓	✓	✓		✓
	50029							
	50030							

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIP-MENT REC'D
	50031							
	50032							
411-02, 441-04 461-08 Bins	50033	✓	✓	✓	✓	✓	✓	✓
	50034							
421-02,04,06,08,10,14,18 431-04,06 Tanks	50035	✓	✓	✓	✓	✓	✓	✓
	50036							
	50037							
	50038							
	50039							
131-04, 06, 08, 10 435-02, 04 Tanks & Reactors	50040	✓	✓	✓	✓	✓	✓	✓
	50041							
	50042							
	50043							
	50044							
	50045							

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIP-MENT REC'D
	50046							
	50047							
	50048							
	50049							
	50050							
	50051							
	50052							
	50053							
	50054							
401-02 Hot Oil Expansion Tank	50055	✓	✓	✓	✓	✓	✓	✓
425-02 Hydrogenation Reactor	50056	✓	✓	✓	✓	✓	✓	✓
445-02 Quartz Liner	50057							
	50058							
445-02 Pyrolysis Reactor and Hopper	50059							
417-02 457-04, 06 Filters	50060	✓	✓	✓	✓	✓	✓	✓

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIP-MENT REC'D
427-02 Crude TCS Filter	50061	✓	✓	✓	✓	✓	✓	✓
437-02 Silane Ultra Filter	50062	✓	✓	✓	✓	✓	✓	✓
	50063							
	50064							
	50065							
	50066							
448-08, 10 Loading Scales	50067							
	50068							
448-04 Boule Cart	50069							
448-14 Boule Scale	50070							
	50071							
	50072							
458-04 Silica Drum Packer	50073	✓	✓	✓	✓	✓	✓	✓
	50074							

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIP-MENT REC'D
459-02, 04 Venturi and Scrubber	50075	✓	✓	✓	✓	✓	✓	✓
429-04 Superheater	50076	✓	✓	✓	✓	✓	✓	✓
	50077							
	50078							
	50079							
	50080							
	50081							
	50082							
459-08, 10, 12, 14 Waste Burners	50083	✓	✓	✓	✓	✓	✓	✓
	50084							
454-04 Silica Agglomerator	50085	✓	✓	✓	✓	✓	✓	✓
469-02 Cooling Tower	50086	✓	✓	✓	✓	✓	✓	✓
469-06 Cooling Tower Treatment	50087	✓	✓	✓	✓	✓	✓	✓
469-12 Refrigeration System	50088	✓	✓	✓	✓	✓	✓	✓

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIP-MENT REC'D
469-16 Therminol Heater	50089	✓	✓	✓	✓	✓	✓	✓
452-02 Muriatic Tailing Column	50090	✓	✓	✓	✓	✓	✓	✓
456-08 Tailing Column Pump	50091	✓	✓	✓	✓	✓	✓	✓
469-14 Instrument Air Package	50092	✓	✓	✓	✓	✓	✓	✓
642-02 MCC	50093	✓	✓	✓	✓	✓	✓	✓
641-02 Transformer	50094	✓	✓	✓	✓	✓	✓	✓
	50095							
365-02 Quality Control Trailer	50096	✓	✓	✓	✓	✓	✓	✓
	50097							
411-08 Tk. Argon Tank	50098							
461-04, 06 Fuel Oil Storage Tank	50099	✓	✓	✓	✓	✓		✓
	50100							
	50101							
643 Emergency Generator	50102	✓	✓	✓	✓	✓	✓	✓

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIP-MENT REC'D
463-06, 08 Ventilation Blower	50103							
	50104							
426-06, 07 STC Pumps	50105	✓	✓	✓	✓	✓	✓	
	50106							
For 432-08 Internals for Silane Column	50107	✓	✓	✓	✓	✓	✓	✓
Chlorosilane Analysis	50108	✓	✓	✓	✓	✓		
UV Spectrophotometer	50109	✓	✓	✓	✓	✓		✓
Elemental Analysis	50110	✓	✓	✓	✓	✓		✓
Silicon Melting Furnace	50111	✓	✓	✓	✓	✓		✓
432-02 Stripper Column	50112	✓	✓	✓	✓	✓		✓
432-04 TCS Column	50113	✓	✓	✓	✓	✓		✓
432-06 DCS Column	50114	✓	✓	✓	✓	✓		✓
459-16 Agitator	50115	✓	✓	✓	✓	✓	✓	✓
429-02 Quench & Solids Removal Contractor	50116	✓	✓	✓	✓	✓	✓	✓

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIP-MENT REC'D
	50117							
	50118							
466-06, 0" Fuel Oil Pumps	50119	✓	✓	✓	✓	✓	✓	✓
	50120							
	50121							
432-08 Silane Column	50122	✓	✓	✓	✓	✓		✓
	50123							
Field Instrumentation	50124	✓	✓	✓	✓	✓		✓
469-20 Instrument Air Dryer	50125	✓	✓	✓	✓	✓	✓	✓
428-04 Solids Conveyor	50126	✓	✓	✓	✓	✓	✓	✓
	50127							
	50128							
464-06 Thaw Heater	50129	✓	✓	✓	✓	✓	✓	✓
Program Controller	50130	✓	✓	✓	✓	✓		

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIP-MENT REC'D
7 Haskel Pumps	50131	✓	✓	✓	✓	✓		
Pressure Lubricators	50132	✓	✓	✓	✓	✓		✓
8 BP Valves & r Springs	50133	✓	✓	✓	✓	✓		✓
Main Instrument Panel "A"	50134	✓	✓	✓	✓	✓		✓
Printer	50135	✓	✓	✓	✓	✓		
Computer	50136	✓	✓	✓	✓	✓		
Memorex Cartridges	50137	✓	✓	✓	✓	✓		
Automatic Valves	50138	✓	✓	✓	✓	✓		✓
Automatic Valves	50139	✓	✓	✓	✓	✓		✓
Automatic Valves	50140	✓	✓	✓	✓	✓		✓
Augomatic Valves	50141	✓	✓	✓	✓	✓		✓
Automatic Valves	50142	✓	✓	✓	✓	✓		✓
	50143							
	50144							
7 Gauges	50145	✓	✓	✓	✓	✓		✓

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIPMENT REC'D
Pressure Lubricators	50146	✓	✓	✓	✓	✓		✓
Thermocouples	50147	✓	✓	✓	✓	✓		✓
7 Level Switches	50148	✓	✓	✓	✓	✓		
	50149							
Sewer Tie-In Line	50150	✓	✓	✓	✓	✓		
Service Agreement	50151	✓	✓	✓	✓	✓		
	5015							
Lever Transmitters & Switches	50153	✓	✓	✓	✓	✓		✓
Field Instrumentation	50154	✓	✓	✓	✓	✓		✓
Conditioners & Process Filters	50155	✓	✓	✓	✓	✓		✓
Sample Conditioners	50156	✓	✓	✓	✓	✓		
Sample Conditioners	50157	✓	✓	✓	✓	✓		
	50158							
Manual Valves	50159	✓	✓	✓	✓	✓		✓
Caustic Storage Tank	50160	✓	✓	✓	✓	✓	✓	✓

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIPMENT REC'D
Immersion Heater	50161	✓	✓	✓	✓	✓	✓	✓
Fuel Tank	50162	✓	✓	✓	✓	✓	✓	✓
Shipping Preparation & Freight	50163					✓		
Automatic Valve	50164	✓	✓	✓	✓	✓		✓
	50165							
Main Instrument Panel "A"	50166	✓	✓	✓	✓	✓		
Main Instrument Panel "A"	50167	✓	✓	✓	✓	✓		
Field Instrumentation	50168	✓	✓	✓	✓	✓		
Main Instrument Panel "A"	50169	✓	✓	✓	✓	✓		
Main Instrument Panel "A"	50170	✓	✓	✓	✓	✓		
	50171							
Main Instrument Panel "A"	50172	✓	✓	✓	✓	✓		
Main Instrument Panel "A"	50173	✓	✓	✓	✓	✓		
Main Instrument Panel "A"	50174	✓	✓	✓	✓	✓		
Main Instrument Panel "A"	50175	✓	✓	✓	✓	✓		

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	P/R ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIPMENT REC'D
Main Instrument Panel "A"	50176	✓	✓	✓	✓	✓		
Field Instrumentation	50177	✓	✓	✓	✓	✓		✓
Field Instrumentation	50178	✓	✓	✓	✓	✓		✓
Field Instrumentation	50179	✓	✓	✓	✓	✓		✓
Field Instrumentation	50180	✓	✓	✓	✓	✓		✓
Field Instrumentation	50181	✓	✓	✓	✓	✓		✓
Field Instrumentation	50182	✓	✓	✓	✓	✓		✓
Field Instrumentation	50183	✓	✓	✓	✓	✓		✓
Field Instrumentation	50184	✓	✓	✓	✓	✓		✓
Field Instrumentation	50185	✓	✓	✓	✓	✓		✓
Valves	50186	✓	✓	✓	✓	✓		✓
Filter Bags	50187	✓	✓	✓	✓	✓	✓	✓
Valves	50188	✓	✓	✓	✓	✓		✓
Valves	50189	✓	✓	✓	✓	✓		✓
Automatic Valves	50190	✓	✓	✓	✓	✓		✓

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIPMENT REC'D
Automatic Valves	50191	✓	✓	✓	✓	✓		✓
Automatic Valves	50192	✓	✓	✓	✓	✓		✓
Automatic Valves	50193	✓	✓	✓	✓	✓		✓
Check Valves	50194	✓	✓	✓	✓	✓		✓
Field Instrumentation	50195	✓	✓	✓	✓	✓		✓
	50196							
Field Instrumentation	50197	✓	✓	✓	✓	✓		✓
	50198							
Field Instrumentation	50199	✓	✓	✓	✓	✓		✓
Field Instrumentation	50200	✓	✓	✓	✓	✓		✓
Field Instrumentation	50201	✓	✓	✓	✓	✓		✓
Controller	50202	✓	✓	✓	✓	✓		✓
Instrument Field List	50203	✓	✓	✓	✓	✓		
Instrument Field List	50204	✓	✓	✓	✓	✓		✓
Instrument Field List	50205	✓	✓	✓	✓	✓		✓

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIPMENT REC'D
Manual Valve Packless	50206	✓	✓	✓	✓	✓		✓
Rubber Hose	50207	✓	✓	✓	✓	✓		✓
	50208							
Field Instrumentation	50209	✓	✓	✓	✓	✓		✓
Field Instrumentation	50210	✓	✓	✓	✓	✓		✓
Field Instrumentation	50211	✓	✓	✓	✓	✓		✓
Field Instrumentation	50212	✓	✓	✓	✓	✓		✓
	50213							
Field Instrumentation	50214	✓	✓	✓	✓	✓		✓
Field Instrumentation	50215	✓	✓	✓	✓	✓		✓
Manual Valves "Packless"	50216	✓	✓	✓	✓	✓		✓
Manual Lined But-Valves	50217	✓	✓	✓	✓	✓		✓
Main Instrument Panel	50218	✓	✓	✓	✓	✓		
Panel No. 2 "E"	50219	✓	✓	✓	✓	✓		✓
Panel No. 1 "D"	50220	✓	✓	✓	✓	✓		✓

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIPMENT REC'D
Panel No. 4 "G"	50221	✓	✓	✓	✓	✓		✓
Panel No. 3 "F"	50222	✓	✓	✓	✓	✓		✓
Sample Panel "QA"	50223	✓	✓	✓	✓	✓		✓
Rav Valve Packing Pressurization	50224	✓	✓	✓	✓	✓		✓
Solenoid Valves	50225	✓	✓	✓	✓	✓		
Teflon-Lined Piping	50226	✓	✓	✓	✓	✓		✓
Sample Conditioners	50227	✓	✓	✓	✓	✓		
Sample Conditioners	50228	✓	✓	✓	✓	✓		
Fittings	50229	✓	✓	✓	✓	✓		
48 Packless Valves & 18 Diaphragms	50230	✓	✓	✓	✓	✓		
Sample Conditioners	50231	✓	✓	✓	✓	✓		
Manual Knife Valve	50232	✓	✓	✓	✓	✓		✓
Safety Relief Valves	50233	✓	✓	✓	✓	✓		✓
Safety Relief Valves	50234	✓	✓	✓	✓	✓		✓
Vacuum Relief Valves	50235	✓	✓	✓	✓	✓		✓

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIP-MENT REC'D
SS Tubing	50236	✓	✓	✓	✓	✓		
	50237							
High Temperature Check Valves	50238	✓	✓	✓	✓	✓		✓
High Temperature Manual Globe Valves	50239	✓	✓	✓	✓	✓		✓
Manual Valves	50240	✓	✓	✓	✓	✓		✓
Expansion Joints	50241	✓	✓	✓	✓	✓		✓
Expansion Joints	50242	✓	✓	✓	✓	✓		✓
Manual 3-Way Valves	50243	✓	✓	✓	✓	✓		
Pump Connectors	50244	✓	✓	✓	✓	✓		✓
Diaphragm Pump	50245	✓	✓	✓	✓	✓		
Automatic Valve	50246	✓	✓	✓	✓	✓		
Bursting Discs	50247	✓	✓	✓	✓	✓		✓
Check Valves	50248	✓	✓	✓	✓	✓		✓
Automatic Valve	50249	✓	✓	✓	✓	✓		✓

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIPMENT REC'D
Field Instrumentation	50250	✓	✓	✓	✓	✓		✓
Field Instrumentation	50251	✓	✓	✓	✓	✓		✓
Field Instrumentation	50252	✓	✓	✓	✓	✓		✓
Field Instrumentation	50253	✓	✓	✓	✓	✓		✓
Field Instrumentation	50254	✓	✓	✓	✓	✓		✓
Field Instrumentation	50255	✓	✓	✓	✓	✓		✓
Field Instrumentation	50256	✓	✓	✓	✓	✓		✓
Field Instrumentation	50257	✓	✓	✓	✓	✓		✓
Field Instrumentation	50258	✓	✓	✓	✓	✓		✓
Field Instrumentation	50259	✓	✓	✓	✓	✓		✓
Field Instrumentation	50260	✓	✓	✓	✓	✓		✓
Field Instrumentation	50261	✓	✓	✓	✓	✓		✓
Field Instrumentation	50262	✓	✓	✓	✓	✓		✓
Field Instrumentation	50263	✓	✓	✓	✓	✓		✓
Field Instrumentation	50264	✓	✓	✓	✓	✓		✓

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIP-MENT REC'D
Field Instrumentation	50265	✓	✓	✓	✓	✓		✓
Field Instrumentation	50266	✓	✓	✓	✓	✓		✓
Field Instrumentation	50267	✓	✓	✓	✓	✓		✓
Field Instrumentation	50268	✓	✓	✓	✓	✓		
Field Instrumentation	50269	✓	✓	✓	✓	✓		✓
Field Instrumentation	50270	✓	✓	✓	✓	✓		✓
Field Instrumentation	50271	✓	✓	✓	✓	✓		✓
Sample Conditioners	50272	✓	✓	✓	✓	✓		
Level Guage	50273	✓	✓	✓	✓	✓		✓
HCl Monitor	50274	✓	✓	✓	✓	✓		
HCl Monitor	50275	✓	✓	✓	✓	✓		
HCl Monitor	50276	✓	✓	✓	✓	✓		
HCl Monitor	50277	✓	✓	✓	✓	✓		
Thermostat & Finstrip Heater	50278	✓	✓	✓	✓	✓		
HCl Monitor	50279	✓	✓	✓	✓	✓		

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIP-MENT REC'D
HCl Monitor	50280	✓	✓	✓	✓	✓		
HCl Monitor	50281	✓	✓	✓	✓	✓		
Main Instrument Panel "A"	50282	✓	✓	✓	✓	✓		
Main Instrument Panel "A"	50283	✓	✓	✓	✓	✓		
Main Instrument Panel "A"	50284	✓	✓	✓	✓	✓		
Main Instrument Panel "A"	50285	✓	✓	✓	✓	✓		
Main Instrument Panel "A"	50286	✓	✓	✓	✓	✓		
Main Instrument Panel "A"	50287	✓	✓	✓	✓	✓		
Main Instrument Panel "A"	50288	✓	✓	✓	✓	✓		
Main Instrument Panel "A"	50289	✓	✓	✓	✓	✓		
Panel "E"	50290	✓	✓	✓	✓	✓		
Panel "E"	50291	✓	✓	✓	✓	✓		
Panel "E"	50292	✓	✓	✓	✓	✓		
Panel "E"	50293	✓	✓	✓	✓	✓		
Panel "E"	50294	✓	✓	✓	✓	✓		

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIP-MENT REC'D
Panel "D"	50295	✓	✓	✓	✓	✓		
Panel "D"	50296	✓	✓	✓	✓	✓		
Panel "D"	50297	✓	✓	✓	✓	✓		
Panel "D"	50298	✓	✓	✓	✓	✓		
Panel "D"	50299	✓	✓	✓	✓	✓		
Panel "Q"	50300	✓	✓	✓	✓	✓		
Panel "Q"	50301	✓	✓	✓	✓	✓		
Panel "Q"	50302	✓	✓	✓	✓	✓		
Panel "Q"	50303	✓	✓	✓	✓	✓		
Panel "Q"	50304	✓	✓	✓	✓	✓		
Panel "Q"	50305	✓	✓	✓	✓	✓		
Panel "Q"	50306	✓	✓	✓	✓	✓		
Panel "Q"	50307	✓	✓	✓	✓	✓		
Panel "Q"	50308	✓	✓	✓	✓	✓		
Panel "Q"	50309	✓	✓	✓	✓	✓		

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIPMENT REC'D
Panel "Q"	50310	✓	✓	✓	✓	✓		
Panel "Q"	50311	✓	✓	✓	✓	✓		
	50312							
Panel "G"	50313	✓	✓	✓	✓	✓		
	50314							
	50315							
Plastic Ball Valves	50316	✓	✓	✓	✓	✓		✓
Lined Plug Valves	50317	✓	✓	✓	✓	✓		✓
Pressure Indicators	50318	✓	✓	✓	✓	✓		✓
Pressure Guages	50319	✓	✓	✓	✓	✓		✓
Field Instrumentation	50320	✓	✓	✓	✓	✓		✓
Temperature Indicators	50321	✓	✓	✓	✓	✓		✓
Backflow Preventer	50322	✓	✓	✓	✓	✓		✓
SS Pipe	50323	✓	✓	✓	✓	✓		✓
SS Pipe Fittings	50324	✓	✓	✓	✓	✓		✓

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIPMENT REC'D
Flange Gasket	50325	✓	✓	✓	✓	✓		
Manual Ball Valves	50326	✓	✓	✓	✓	✓		✓
	50327							
	50328							
Porex Breathers	50329	✓	✓	✓	✓	✓		✓
Inline Filters	50330	✓	✓	✓	✓	✓		✓
Inline Strainers	50331	✓	✓	✓	✓	✓		✓
	50332							
	50333							
Filters	50334	✓	✓	✓	✓	✓		
Pipe Fittings	50335	✓	✓	✓	✓	✓		✓
Sample Panel "A"	50336	✓	✓	✓	✓	✓		✓
	50337							
Fume Hood	50338	✓	✓	✓	✓	✓		✓
SS Pipe Fittings	50339	✓	✓	✓	✓	✓		✓

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIPMENT REC'D
	50340							
Vogt Valve	50341	✓	✓	✓	✓	✓		
Sample Panel "A"	50342	✓	✓	✓	✓	✓		
	50343							
Sample Panel "A"	50344	✓	✓	✓	✓	✓		
Sample Panel "N"	50345	✓	✓	✓	✓	✓		
Sample Panel "N"	50346	✓	✓	✓	✓	✓		
Sample Panel "N"	50347	✓	✓	✓	✓	✓		
Sample Panel "A"	50348	✓	✓	✓	✓	✓		
Sample Panel "A"	50349	✓	✓	✓	✓	✓		
Sample Panel "A"	50350	✓	✓	✓	✓	✓		
	50351							
	50352							
	50353							
	50354							

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIPMENT REC'D
Xerox Copier Rental	50355				✓	✓		

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIPMENT REC'D
Caged Ladder	24302	✓	✓	✓	✓	✓		
Vacuum Relief Valves	29751	✓	✓	✓	✓	✓		
Check Valves	32521	✓	✓	✓	✓	✓		
Field Instrumentation	33651	✓	✓	✓	✓	✓		✓
Gasket & O-Rings	33653	✓	✓	✓	✓	✓		
Instrument Equipment List	33654	✓	✓	✓	✓	✓		✓
Plant Emergency Trip System	38094	✓	✓	✓	✓	✓		
Computer Components	38177	✓	✓	✓	✓	✓		
Instrument Equipment List	33655	✓	✓	✓	✓	✓		
Ram Valve Assembly	33656	✓	✓	✓	✓	✓		
Ram Valve Assembly	33657	✓	✓	✓	✓	✓		
Detector	33660	✓	✓	✓	✓	✓		
Peristaltic Pump	33661	✓	✓	✓	✓	✓		
Cartride Tape	33662	✓	✓	✓	✓	✓		
Lab Equipment	33663	✓	✓	✓	✓	✓		

EQUIPMENT PROCUREMENT STATUS

EQUIPMENT NO. & NAME	P. O. NUMBER	FUNC SPECS ISSUED	ENG SPECS ISSUED	RFQ ISSUED	RFR ISSUED	P.O. ISSUED	CERTIFIED DWG REC'D	EQUIPMENT REC'D
Microscope	33664	✓	✓	✓	✓	✓		
Graphic Plotter	35516	✓	✓	✓	✓	✓		
Printer	35517	✓	✓	✓	✓	✓		
D-100 Terminals	35519	✓	✓	✓	✓	✓		
Modem	35518	✓	✓	✓	✓	✓		
Spare Parts	33666	✓	✓	✓	✓	✓		
Transmitters	33667	✓	✓	✓	✓	✓		
Automatic Valve Parts	33679	✓	✓	✓	✓	✓		
Automatic Valve Parts	33681	✓	✓	✓	✓	✓		
Spare Parts	33670	✓	✓	✓	✓	✓		
Spare Parts	33675	✓	✓	✓	✓	✓		
Spare Parts	33672	✓	✓	✓	✓	✓		
Spare Parts	33682	✓	✓	✓	✓	✓		